

NASA TECH BRIEF



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Improved Frequency Divider Employs Transistor Avalanche Effect

A frequency divider circuit that has been developed can be synchronized over a much wider input control frequency range, has greater phase stability, and is less sensitive to temperature changes than conventional synchronized oscillators used to perform frequency division. The new circuit depends on the avalanche breakdown mode of operation of transistors. Typical characteristics of a divider circuit using the synchronized avalanche oscillator design for a frequency ratio of 57/221 are:

Input frequency, 21.9792 MHz

Output frequency, 5.6688 MHz

Bandwidth (controlled by crystal filter), ± 33 kHz
(-1 db)

Lock range, > 2 percent

Phase instability, approximately 0.01 deg rms

Note:

Inquiries concerning this circuit may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B67-10575

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Carl E. Johns
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Category 01

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Improved Frequency Divider Employing Transistor Amplifier

A frequency divider circuit has been developed which is capable of operating at frequencies up to 100 MHz. The circuit is based on a transistor amplifier and a feedback network. The feedback network consists of a series combination of a capacitor and an inductor. The capacitor is connected to the output of the amplifier and the inductor is connected to the input of the amplifier. The feedback network is designed to provide a phase shift of 180 degrees at the operating frequency. This phase shift, combined with the 180-degree phase shift provided by the amplifier, results in a total phase shift of 360 degrees, which is necessary for sustained oscillation. The circuit is capable of operating at frequencies up to 100 MHz and has a power consumption of less than 100 mW.

Notes

1. The circuit is based on a transistor amplifier and a feedback network. The feedback network consists of a series combination of a capacitor and an inductor. The capacitor is connected to the output of the amplifier and the inductor is connected to the input of the amplifier. The feedback network is designed to provide a phase shift of 180 degrees at the operating frequency. This phase shift, combined with the 180-degree phase shift provided by the amplifier, results in a total phase shift of 360 degrees, which is necessary for sustained oscillation. The circuit is capable of operating at frequencies up to 100 MHz and has a power consumption of less than 100 mW.